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Form Approved
OMB No. 0704-0188

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1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
04 SEP 2014		**00-00-2014 to 00-00-2014**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Coastal Modeling System	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
U.S. Army Engineer Research and Development Center,CIRP - The Coastal Inlets Research Program,3909 Halls Ferry Road,Vicksburg,MS,39180	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**2**	

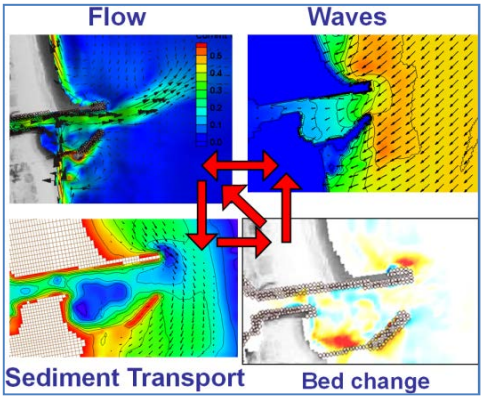
US Army Corps of Engineers®
Engineer Research and Development Center

Coastal Inlets Research Program

Coastal Modeling System

Description

The work unit develops the Coastal Modeling System (CMS) and conducts basic research to further understanding of sediment transport under mixed forcing from waves and currents. The CMS is a suite of coupled two-dimensional numerical models for simulating waves, hydrodynamics, salinity and sediment transport, and morphology change. The CMS was identified by the USACE Hydraulics and Hydrology - Coastal Community of Practice (CoP) as a Preferred model for Coastal Engineering and Coastal Navigation investigations. The work unit also conducts basic research in nearshore hydrodynamics and sediment transport. Ongoing research includes bed-load dispersion, mixed cohesive/non-cohesive sediment transport, modeling long-term morphology change, cross-shore sediment transport, and computer-based model calibration and uncertainty analysis.



Coastal processes simulated by the CMS

Issue Addressed

District scientists and engineers need efficient tools to understand coastal processes and for the design and management of coastal inlets, navigation channels, ports, harbors, coastal structures, and adjacent beaches.

Products

The primary product of the work unit is the Coastal Modeling System (CMS). Auxiliary products include the Surface water Modeling System (SMS) interface. The CMS has been verified and validated with analytical, laboratory, and field data sets that document idealized and applied wave, current, sediment transport and morphology change studies.

Application of Products

CMS has been applied at more than 70 project sites in the US and 7 international project sites. Examples documented in CMS reports include Matagorda Bay, Texas; Grays Harbor, Washington; Mouth of the Columbia River, Washington/Oregon; Ocean Beach, California; Southeast Oahu Coast, Hawaii; Field Research Facility, Duck, North Carolina; Hazaki Oceanographic Research Facility, Japan; Mississippi Sound and Barrier Islands; Gironde Estuary, France; St. Augustine Inlet, Florida; and Shark River Inlet, New Jersey.

Projected Benefits

The CMS provides coastal engineers and scientists a PC-based, easy-to-use, accurate, and efficient tool to assist in designing and managing coastal engineering and navigation projects by facilitating the following:

- Integrated and coupled calculations of waves, currents, water levels, sediment transport and morphology change in and around inlets, ports and harbors, and associated navigation channels and coastal structures such as jetties, breakwaters, groins, and seawalls.
- High resolution short- (weeks) to mid-term (seasonal to multiple years) project scale simulations.

- Representation of a wide range of nearshore physical processes, such as wetting and drying, advection, turbulent mixing, forcing from tides, wind, atmospheric pressure, and waves; river flows, wave-current interaction, multiple-sized sediment transport, bed sorting, and morphology change.
- Representation of weirs, culverts, porous rubble mounds, and tidal gates.

Documentation

CMS help is available through workshops, webinars, on-site training, and a wiki. Technical documentation for CMS-Flow and CMS-Wave is presented in ERDC/CHL TR-14-2 and TR-08-13, respectively. Documentation on verification and validation is given in TR-11-10. The wiki website wiki contains technical documentation, user guidance, step-by-step instructions, links to utilities, and many other useful resources. The User Manual may be downloaded from the wiki website. For more information, please visit CIRP online.

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CIRP Website

- Please see the CIRP website to download documentation: http://www.erdc.usace.army.mil/Missions/WaterResources/CIRP/Publications.aspx
- View archived webinars: http://www.erdc.usace.army.mil/Missions/WaterResources/CIRP/TechTransfer.aspx and
- Review guidance documented on the CIRP wiki: http://cirpwiki.info/wiki/CMS.